

**REMARKS**

**I. INTRODUCTION**

Claims 63, 94 and 95 have been cancelled, without prejudice. Claims 81-93 have been withdrawn from consideration as being directed to non-elected subject matter. Claims 3, 7-10, 13-18, 23, 32, 34-36, 39-41, 43, 44, 46, 55, 58-60, 62, 64, 68, 69, 71, 79 and 80 have been amended above. New claims 96 and 97 have been added. Accordingly, claims 1-62, 64-80, 96 and 97 are now under consideration in the above-referenced application. Provided above, please find a claim listing indicating the cancellation of claims 63, 94 and 95, current amendments to previously-pending claims 3, 7-10, 13-18, 23, 32, 34-36, 39-41, 43, 44, 46, 55, 58-60, 62, 64, 68, 69 and 80, and addition of new claims 96 and 97 on separate sheets so as to comply with the requirements set forth in 37 C.F.R. § 1.121. It is respectfully submitted that no new matter has been added.

**II. INFORMATION DISCLOSURE STATEMENT**

In the Office Action, the Examiner confirms that the information submitted with the Information Disclosure Statement filed for the above referenced application have been considered as to the merits. Applicants appreciate the consideration of all submitted materials by the Examiner.

In the Office Action, the Examiner states that “applicant is aware of a document or section of a document that is highly relevant to patentability, the Examiner requests that applicant provide a concise explanation of why the English-language information is being submitted and how it is understood to be relevant. This request is

being made because of a large number of documents submitted ... ." (Office Action, p. 2, Ins. 12-17).

Simply because Applicants submitted a large number of references and pieces of information, such fact does not relieve the duty on the Patent Office to diligently assess each such reference as its applicability to the pending claims of the above-identified application. Applicants submitted all reference and information for the present application in full compliance with the laws of the United States and 37 C.F.R. to appropriately bring such references to the attention of the Patent Office. With such task accomplished successfully, the Patent Office has a duty to determine the applicability of such references to the pending claims, and inform applicant of the same. This duty cannot be removed when there are a large number of submitted references and information.

It is well established that Applicants are only required to disclose to the U.S. Patent and Trademark Office (the "Patent Office") "all information known to ... [all] individual[s identified in 37 C.F.R. 1.56(a)] to be material to patentability ... [of the claims of the application as defined in 37 C.F.R. 1.56]." 37 C.F.R. 1.56(a). There is no requirement in this section or any other section of 37 C.F.R. to specifically identify which references (and/or parts thereof) Applicants deem to be material to patentability of the claims pending in the above-identified application. Indeed, while 37 C.F.R. 1.56(a) provides that "[t]here is no duty to submit information which is not material to the patentability of any existing claim," there is nothing in this section which precludes the submission of any information which may not be material to the patentability of any pending claims in the subject application.

Clearly, Applicants are under no known duty to specifically identify to the Patent Office which references (and/or portions thereof) are material to the patentability of

any pending claim of this application. Indeed, Applicants clearly complied with the requirements set forth in 37 C.F.R. § 1.56 by providing to the Patent Office all references which may relate to the claims of the above-referenced application, whether they are material or immaterial to the patentability of any of the pending claims.

Further, because Applicants submitted a large number of references and pieces of information, such fact does not relieve the duty on the Patent Office to diligently assess each such reference as its applicability to the pending claims of the above-identified application. Applicants submitted all reference and information for the present application in full compliance with the laws of the United States and 37 C.F.R. to appropriately bring such references to the attention of the Patent Office. With such task accomplished successfully, the Patent Office has a duty to determine the applicability of such references to the pending claims, and inform applicant of the same. This duty cannot be removed when there are a large number of submitted references and information. Applicants disagree that because a large number of references being submitted, it would be "impossible" for the U.S. Patent and Trademark Office to "fairly assess" Applicants' application.

To expedite the prosecution of the present application, but not due to any requirements on Applicants under law, the Examiner's attention can be directed to the prosecution of related International Application PCT/US04/18045 filed June 4, 2004, including the PCT Search Report, PCT Written Opinion, references cited therein (i.e., International Publication WO 02/054027, International Publication WO 98/35203, European Patent Publication No. 0110201 and U.S. Patent Nos. 4,868,834; 2,339,754; 4,601,036; 4,993,834; 5,040,889; 5,975,697; and 5,459,570), and PCT Preliminary Examination Report for the related International application. All such documents have been submitted in Information Disclosure Statement(s) for the present application.

**III. REJECTION UNDER 35 U.S.C. § 112 SHOULD BE WITHDRAWN**

Claim 80 stands rejected under 35 U.S.C. § 112, second paragraph as being allegedly indefinite. In the Office Action, the Examiner contends that the recitation of “at least one second arrangement” recited in claim 80 is actually capable of. As the Examiner shall ascertain, independent claim 80 has been amended to recite that at least one second arrangement is “configured to shift the frequency of at least one of the at least one first electro-magnetic radiation or the at least one second electromagnetic radiation and further configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency.”

Accordingly, Applicants respectfully assert that the 35 U.S.C. § 112, second paragraph rejection of claim 80 is now moot, and should therefore be withdrawn.

**IV. REJECTIONS UNDER 35 U.S.C. §§102 and 103 SHOULD BE WITHDRAWN**

Claims 21, 22, 24-26, 31, 33, 44 and 45 stand rejected under 35 U.S.C. §102(b) as being allegedly anticipated by U.S. Patent No. 5,956,355 issued to Swanson et al. (the “Swanson Patent”). Claims 1, 2, 4-7, 18-20, 27-30, 71-79 and 94-95 stand rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over the Swanson Patent. Claims 3, 8-17, 23, 34-43 and 80 stand rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over the Swanson Patent, in view of U.S. Patent No. 6,134,003 issued to Tearney et al. (the “Tearney Patent”). Claim 32 stands rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over the Swanson Patent in view of the Tearney Patent, and in further view of U.S. Patent No. 4,601,036, issued to Faxvog et al. (the “Faxvog Patent”). Claims 46-54 and 56-70 stand rejected under 35 U.S.C. §103(a) as

being allegedly unpatentable over the Tearney Patent, in view of the Swanson Patent. Claim 55 stands rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over the Tearney Patent in view of the Swanson Patent, and in further view of the Faxvog Patent. Applicants respectfully assert that the Swanson Patent, taken alone or in combination with the Tearney Patent and/or the Faxvog Patent, fail to teach, suggest or disclose the subject matter recited in independent claims 1, 20, 21, 45, 46, 69, 71 and 79, amended independent claim 80 and the claims which depend therefrom for at least the following reasons.

In order for a claim to be rejected as anticipated under 35 U.S.C. § 102, each and every element as set forth in the claim must be found, either expressly or inherently described, in a single prior art reference. Manual of Patent Examining Procedures, §2131; also see *Lindeman Maschinenfabrik v. Am Hoist and Derrick*, 730 F.2d 1452, 1458 (Fed. Cir. 1984).

Under 35 U.S.C. § 103(a), a person is not entitled to a patent even though the invention is not identically disclosed or described as set forth in §102, "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a).

The objective standard for determining obviousness under 35 U.S.C. § 103, as set forth in *Graham v. John Deere, Co.*, 383 U.S. 1 (1966), requires a factual determination to ascertain: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; and (3) the differences between the claimed subject matter and the prior art. Based on these factual inquiries, it must then be determined, as a matter of law,

whether or not the claimed subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the alleged invention was made. *Graham*, 383 U.S. at 17. Courts have held that there must be some suggestion, motivation or teaching of the desirability of making the combination claimed by the applicant (the “TSM test”). See *In re Beattie*, 974 F.2d 1309, 1311-12 (Fed. Cir. 1992). This suggestion or motivation may be derived from the prior art itself, including references or disclosures that are known to be of special interest or importance in the field, or from the nature of the problem to be solved. *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573 (Fed. Cir. 1996).

Although the Supreme Court criticized the Federal Circuit’s application of the TSM test, see *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741, (2007) the Court also indicated that the TSM test is not inconsistent with the *Graham* analysis recited in the *Graham v. John Deere* decision. *Id.*; see *In re Translogic Technology, Inc.*, No. 2006-1192, 2007 U.S. App. LEXIS 23969, \*21 (October 12, 2007). Further, the Court underscored that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *KSR*, 127 S. Ct. at 1741. Under the precedent established in *KSR*, however, the presence or absence of a teaching, suggestion, or motivation to make the claimed invention is merely one factor that may be weighed during the obviousness determination. *Id.* Accordingly, the TSM test should be applied from the perspective of a person of ordinary skill in the art and not the patentee, but that person is creative and not an automaton, constrained by a rigid framework. *Id.* at 1742. However, “the reference[s] must be viewed without the benefit of hindsight afforded to the disclosure.” *In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir. 1994).

The prior art cited in an obviousness determination should create a reasonable expectation, but not an absolute prediction, of success in producing the claimed invention. *In re O'Farrell*, 853 F.2d 894, 903-04 (Fed. Cir. 1988). Both the suggestion and the expectation of success must be in the prior art, not in applicant's disclosure. *Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd.*, 927 F.2d 1200, 1207 (Fed. Cir. 1991) (citing *In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988)). Further, the implicit and inherent teachings of a prior art reference may be considered under a Section 103 analysis. *See In re Napier*, 55 F.3d 610, 613 (Fed. Cir. 1995).

Secondary considerations such as commercial success, long-felt but unsolved needs, failure of others, and unexpected results, if present, can also be considered. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538-39 (Fed. Cir. 1983). Although these factors can be considered, they do not control the obviousness conclusion. *Newell Cos. v. Kenney Mfg. Co.*, 864 F.2d 757, 768 (Fed. Cir. 1988).

The Swanson Patent relates to an optical system that includes an external-cavity frequency-tuned laser having a tunable longitudinal cavity mode and a center tunable wavelength. The external-cavity frequency-tuned laser includes an optical cavity, an optical gain medium positioned within the optical cavity, and a rapid tuning wavelength selecting device positioned to receive light from the optical gain medium and adapted to return selected wavelengths of light to the optical gain medium. This system also includes an interferometer that projects a portion of light from the external-cavity frequency-tuned laser onto a sample, to receive light altered by the sample, and to combine light reflected from the sample and the light from the external-cavity frequency-tuned laser. (See Swanson Patent, Abstract).

Further, as described in the Swanson Patent, a laser source 141 can be provided, which is coupled into a first port 208 of a Faraday circulator 204. Light is passed from a second port of the Faraday circulator 212, where it is directed to a probe module 42. The probe module 42 couples light to and from the sample 38 of interest and performs lateral scanning (Arrow L). In addition, the probe module 42 includes a reference reflection reflector 44 which is a partially transmissive beam splitter (e.g., 10%). The reference reflector can also be flat cleaved output end 45 of fiber 212. (See *id.*, col. 10, Ins. 7-17).

The Tearney Patent relates to an imaging system for performing optical coherence tomography includes an optical radiation source, a reference optical reflector; a first optical path leading to the reference optical reflector; and a second optical path coupled to an endoscopic unit. The endoscopic unit preferably includes an elongated housing defining a bore, a rotatable single mode optical fiber having a proximal end and a distal end positioned within and extending the length of the bore of the elongated housing; and an optical system coupled to the distal end of the rotatable single mode optical fiber, positioned to transmit the optical radiation from the single mode optical fiber to the structure and to transmit reflected optical radiation from the structure to the single mode optical fiber. (See Tearney Patent, Abstract).

In particular, as described in the Tearney Patent, the reference light must be frequency shifted to move the interference signal away from baseband  $1/f$ -type noise and to prevent aliasing using serrodyne techniques with a phase shifter or an acousto-optic frequency shifter 128 (and element 124). (See *id.*, col. 6, Ins. 30-35; and Fig. 4). Further, wound fibers in each arm 188 and 110 of the arrangement shown in Fig. 4 of the tearney patent are wound identically to match as closely as possible the fiber birefringence. To



correct for the bending induced birefringence in both arms, a Faraday circulator 130 is placed in the sample and reference arms after the wound fibers. Faraday circulators 130 have the property of unscrambling the polarization upon return of the light at the input. (See *id.*, col. 7, lns. 15-22; and Fig. 4).

**A. Independent Claims 1 and 20, and Dependent Claims**

Applicants' invention, as recited in independent claim 1, relates to an apparatus, which comprises, *inter alia*:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a **non-reflective reference** ....

Independent claim 20 relates to a method which recites similar subject matter.

Applicants respectfully assert that the Swanson Patent, taken alone or even if combined with the Tearney Patent, in no way teaches or suggests, *inter alia*, **providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a non-reflective reference**, as recited in independent claims 1 and 20 of the above-identified application.

In the Office Action, the Examiner admits that the Swanson Patent fails to teach such subject matter, but contends that the partially-transmissive reference satisfies the limitation. (See Office Action, p. 6). However, the Examiner contends that the partially-transmissive reference of the Swanson Patent has some reflective properties, and thus cannot be the "*non-reflective*" as recited in independent claims 1 and 20. Particularly, in the Office Action, the Examiner explains his position by pointing to a reference flat 44 as

described in the Swanson Patent as allegedly providing the non-reflective properties for the reference. (See *id.*, p. 6, Ins. 6-11).

In fact, this reference flat 44 is purported by the Examiner to be a “non-reflective” reference flat. (See *id.*, p. 6, Ins. 8-9). However, the Swanson Patent, in col. 10, Ins. 13-14 thereof, describes that element 44 is a reference “reflection reflector.” Thus, not only the Swanson Patent *fails* to teach or suggest that its reference flat 44 is “non-reflective”, in fact, the Swanson Patent *teaches away* from the claim subject matter as being “reflection reflector.” Further, on col. 10, Ins. 14-16 thereof, the Swanson Patent discusses the reflector being a “partially-transmissive” beam splitter, therefore, certainly as not being “non-reflective.”

Further, the Examiner’s contention in the Office Action that the use of the non-reflective reference surface is functionally equivalent to the use of the reflective reference surface is certainly not true. Indeed, the surface of the reflective reference of the Swanson Patent designates a location relative to the depth within the sample. If such surface provides no reflection, the system of the Swanson Patent would likely not operate at all. Thus, contrary to the Examiner’s initial belief, it would in no way be obvious to substitute the reflective reference surface of the Swanson Patent with the surface of the non-reflective reference, as recited in independent claims 1 and 20. Indeed, as the Swanson Patent system would likely no longer operate with such a substitution, and for at least this additional reason, the Swanson Patent ***teaches away*** from providing a non-reflective reference.

The Tearney Patent does not cure at least such deficiencies of the Swanson Patent, and the Examiner does not contend that it does.

Thus, for at least these reasons, Applicants respectfully submit that the Swanson Patent, either taken alone or in combination with the Tearney Patent, does not render the subject matter recited in independent claims 1 and 20 obvious under 35 U.S.C. § 103(a). Claims 2-19 which depend from independent claim 1 are also not taught, suggested or disclosed by the Swanson Patent, either taken alone or in combination with the Tearney Patent, under 35 U.S.C. § 103(a) for at least the same reasons.

Accordingly, withdrawal of the rejections of these claims under 35 U.S.C. § 103(a) is respectfully requested. Additional arguments regarding certain claims which depend from independent claim 1 shall be provided in further detail below, as applicable.

**B. Independent Claims 21 and 45, and Dependent Claims**

Applicants' invention, as recited in independent claim 21, relates to an apparatus, which comprises, *inter alia*:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first electromagnetic radiation or the second electro-magnetic radiation has a spectrum which changes over time, **the spectrum containing multiple differing longitudinal modes ...**

Independent claim 45 relates to a method which recites similar subject matter.

Applicants respectfully assert that the Swanson Patent does not disclose apparatus or method in which **the first second electro-magnetic radiation (provided to the sample) and/or the second electro-magnetic radiation (provided to the reference) has a spectrum containing multiple differing longitudinal modes which changes over time**, as recited in independent claims 21 and 45 of the above-identified application. In the Office Action, the Examiner contends that because the light source 14 of the Swanson

Patent is a tunable laser, the spectrum of at least one of the radiations provided to the sample and/or reference therein contains multiple differing longitudinal modes. (See Office Action, p. 4, Ins. 4-6).

Indeed, the Swanson Patent provides a tunable laser 14 which uses both the resonator and the frequency filter 70, 312 to adjust the frequency of the electro-magnetic radiation, but maintains the same longitudinal mode for the spectrum of the electro-magnetic radiation. (See Swanson Patent, col. 3, Ins. 51-55; col. 15, Ins. 47-63; and Figs. 1, 2 and 6). For example, on col. 3, ln. 55 of the Swanson Patent, it is indicated that the axial mode of the laser 14 does not hop, which means that the spectrum of the electro-magnetic radiation generated thereby has only a single mode. Thus, surely, this tunable laser 14 of the Swanson Patent *does not generate radiation having the spectrum containing multiple differing longitudinal modes*. Indeed, the Swanson Patent may provide the radiation having a spectrum having *a single longitudinal mode with adjustable frequency*, but does not provide the electro-magnetic radiation having a spectrum with **multiple differing longitudinal modes**, as recited in independent claims 21 and 45.

The Tearney Patent does not cure at least this deficiency, and the Examiner does not contend that it does.

Thus, for at least these reasons, Applicants respectfully submit that the Swanson Patent does not render the subject matter recited in independent claims 21 and 45 anticipated under 35 U.S.C. § 102(b). Claims 2-19 which depend from independent claim 1 are also not taught, suggested or disclosed by the Swanson Patent, either taken alone or in combination with the Tearney Patent, under 35 U.S.C. §§ 102(b) and 103(a), as applicable, for at least the same reasons.

Thus, withdrawal of the rejections of these claims under 35 U.S.C. §§ 102(b) and 103(a), as applicable, is respectfully requested. Additional arguments regarding certain claims which depend from independent claim 21 shall be provided in further detail below, as applicable.

**C. Amended Independent Claims 46 and 69, and Dependent Claims**

Applicants' invention, as recited in amended independent claim 46, relates to an apparatus, which comprises, *inter alia*:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein a frequency of radiation provided by the at least one first arrangement varies over time;

**at least one polarization modulator arrangement which is configured to modulate a polarization of at least one of the first electro-magnetic radiation or the second electro-magnetic radiation over time ...**

Independent claim 69 relates to a method which recites similar subject matter.

Applicants respectfully assert that the Tearney Patent, taken alone or in combination with the Swanson Patent, does not teach or suggest apparatus or method in which **a polarization of at least one of the first electro-magnetic radiation (provided to the sample) and/or the second electro-magnetic radiation (provided to the reference) is modulated over time**, as recited in amended independent claims 46 and 69 of the above-identified application. In the Office Action, regarding the recitation of previously-pending claim 13, the Examiner contends that the Faraday rotators 130 of the Tearney Patent are equivalent to the polarization modulator. (See Office Action, p. 10, Ins. 18-19).

However, The Faraday rotator 130 of the Tearney Patent is a passive device which does not *modulate* any signal, much less is not **configured to modulate a**

**polarization of the electro-magnetic radiation over time**, as recited in amended independent claims 46 and 69. The Swanson Patent and the Faxvog Patent do not cure at least this deficiency, and the Examiner does not contend that they do.

Thus, for at least these reasons, Applicants respectfully submit that the Swanson Patent does not render the subject matter recited in amended independent claims 46 and 69 obvious under 35 U.S.C. § 103(a). Claims 47-68 which depend from amended independent claim 46 are also not taught, suggested or disclosed by the Tearney Patent, either taken alone or in combination with the Swanson Patent and/or the Faxvog Patent, under 35 U.S.C. § 103(a) for at least the same reasons.

Thus, withdrawal of the rejections of these claims under 35 U.S.C. § 103(a) is respectfully requested. Additional arguments regarding certain claims which depend from amended independent claim 46 shall be provided in further detail below, as applicable.

**D. Independent Claims 71 and 79, and Dependent Claims**

Applicants' invention, as recited in amended independent claim 71, relates to an apparatus, which comprises, *inter alia*:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein **at least one of the first electro-magnetic radiation or the second electro-magnetic radiation has a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond ...**

Amended independent claim 79 relates to a method which recites similar subject matter.

Applicants respectfully assert that the Swanson Patent does not disclose apparatus or method in which **the first electro-magnetic radiation (provided to the sample) and/or the second electro-magnetic radiation (provided to the reference) has**

**a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond**, as recited in independent claims 71 and 79 of the above-identified application. In the Office Action, the Examiner admits that the above recitation of is not disclosed in the Swanson Patent. However, the Examiner alleges that it would have been obvious to make a laser with the specifications as set forth in these claims, since the Examiner purports that discovering optimum or working ranges involves only routine skill in the art. (See Office Action, p. 7, last paragraph).

Applicants respectfully disagree, and submit that the use of such tuning speed that is greater than 100 Tera Hertz per millisecond would in no way be obvious to those having ordinary skill in the art, in view of the Swanson Patent.

In particular, the system of the Swanson Patent is extremely sensitive, and any vibrations of the galvanometer 66 described therein which controls the tuning speed of the radiation would detract from the operability of the system of the Swanson Patent. This is because the mechanical degradation of the output of the galvanometer 66 begins to be negatively effected when it is controlled to provide higher tuning speeds for the electromagnetic radiation. In fact, even though the specification of the Swanson Patent describes the ability to provide the 15kHz as a repetition rate for the electromagnetic radiation (which is a much smaller rate than the rate of 100 Tera Hertz per millisecond as recite din claim 18), such rate would certainly come at a high cost of a mechanical stability of the system, readability of the results, and the general operation of the entire system of the Swanson Patent. Thus, causing an even further increase of the tuning speed may likely lead to the system of the Swanson Patent being so unstable to be unusable or a

mechanical breakdown of the galvanometer 66 – both situation would make the system of the Swanson Patent *inoperable*.

For at least such reasons, Applicants respectfully assert that it would not be obvious, in view of the Swanson Patent, to have **the first electro-magnetic radiation (provided to the sample) and/or the second electro-magnetic radiation (provided to the reference) has a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond**, as recited in independent claims 71 and 79 of the above-identified application.

Thus, Applicants respectfully submit that the Swanson Patent does not render the subject matter recited in independent claims 71 and 79 obvious under 35 U.S.C. § 103(a). Claims 71-78 which depend from independent claim 71 are also not taught or suggested by the Swanson Patent under 35 U.S.C. § 103(a) for at least the same reasons.

Thus, withdrawal of the rejections of these claims under 35 U.S.C. § 103(a) is respectfully requested. Additional arguments regarding certain claims which depend from independent claim 71 shall be provided in further detail below, as applicable.

**E. Amended Independent Claim 80**

Applicants' invention, as recited in amended independent claim 80, relates to an apparatus, which comprises, *inter alia*:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein a frequency of at least one of the first electromagnetic radiation or the second electromagnetic radiation provided by the at least one first arrangement varies over time;



**at least one second arrangement configured to shift the frequency of at least one of the at least one first electro-magnetic radiation or the at least one second electromagnetic radiation and further configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency ...**

Independent claim 20 relates to a method which recites similar subject matter.

Applicants respectfully assert that the Swanson Patent, taken alone or even if combined with the Tearney Patent, in no way teaches or suggests an apparatus which comprises, *inter alia*, **at least one second arrangement configured to shift the frequency of the first electro-magnetic radiation (provided to the sample) or the second electromagnetic radiation (provided to the reference) and further configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency**, as recited in amended independent claim 80 of the above-identified application.

In the Office Action, the Examiner admits that the Swanson Patent does not disclose the frequency shifter, but alleges that the Tearney Patent discloses such arrangement. (See Office Action, p. 9, Ins 1-2). The frequency shifter 124 of the Tearney Patent is provided to avoid a low frequency noise. However, this frequency shifter 124 of the Tearney Patent is certainly not configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency, as recited in amended independent claim. In addition, placing a frequency shifter 124 of the Tearney Patent into the system of the Swanson Patent would render the output of the system of the Swanson Patent unusable since it does not even describe what to do with the frequency shifted signal.

For at least such reasons, Applicants respectfully assert that the alleged combination of the Swanson and Tearney Patents fail to teach or suggest an apparatus which comprises, *inter alia*, **at least one second arrangement configured to shift the frequency of the first electro-magnetic radiation (provided to the sample) or the second electromagnetic radiation (provided to the reference) and further configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency**, as recited in amended independent claim 80 of the above-identified application.

Thus, for at least these reasons, Applicants respectfully submit that the Swanson Patent, either taken alone or in combination with the Tearney Patent, does not render the subject matter recited in amended independent claim 80 obvious under 35 U.S.C. § 103(a). Thus, withdrawal of the rejection of this claim under 35 U.S.C. § 103(a) is respectfully requested.

**F. Additional Arguments for Dependent Claims**

With respect to amended claims 3 and 23 which depend from independent claims 1 and 21, respectively, these claims recite that at least one third arrangement configured to shift the frequency of at least one of the at least one first electro-magnetic radiation, the at least one second electromagnetic radiation, the at least one third electro-magnetic radiation or the at least one fourth electro-magnetic radiation, and **further configured to at least partially reduce, differentiate or eliminate negative frequency components of the frequency**. Thus, these claims include certain similar recitations as provided in amended independent claim 80. Accordingly, the same argument as provided

above with respect to amended independent claim 80 are equally applicable to amended claims 3 and 23.

Concerning claims 7 and 8, claim 34 and claims 58-60, which depend from independent claims 1, 21 and 46, respectively, these claims recite **at least one second arrangement comprises at least one photodetector and at least one electrical analog filter which follows the at least one photodetector**. The Swanson Patent does not disclose any electrical filter which follows the photodiode 50. However, in the Office Action, the Examiner believes that the A/D converter and the signal processor 22 can be equated to the electrical filter of claims 7 and 8. (See Office Action, p. 6, ln. 20). This is not the case – in fact, the signal processor 22 of the Swanson Patent is a digital signal process which follows the A/D converter. Thus, this processor of the Swanson Patent is not an electrical analog filter.

Regarding claims 12, 38 and 62, which depend from independent claims 1, 21 and 46, respectively, these claims recite that **the catheter is rotated at a speed higher than 30 revolutions per second**. In the Office Action, the Examiner believes that this recitation is obvious as employing optimum ranges. (See Office Action, p. 10, lns. 12-17). Applicants respectfully disagree. In particular, if such speed would be employed in the catheter of the Tearney Patent, the resultant output would be a blurred image, which is certainly not a useful result. Thus, using such high speed of rotation would not be obvious in view of the Tearney Patent. In fact, because of the likelihood of obtaining such poor results in the Tearney Patent, it teaches away from using a speed higher than 30 revolutions per second, as recited in claims 12, 38 and 62.

For amended claims 13 and 39, which depend from independent claims 1 and 21, respectively, these claims recite **at least one polarization modulator which is configured to modulate a polarization of the electro-magnetic radiation over time**. Thus, these claims include certain similar recitations as provided in amended independent claims 46 and 69. Accordingly, the same argument as provided above with respect to amended independent claims 46 and 69 are equally applicable to amended claims 13 and 39.

With respect to amended claims 15 and 17 and amended claims 41 and 43, which depend from independent claims 1 and 21, respectively, these claims recite that the second arrangement comprises **at least one dual balanced receiver which is configured to remove an auto-correlation associated with the at least one third radiation**. The Tearney Patent does not disclose that the dual balanced receiver is configured to remove an auto-correlation associated with the at least one third radiation, and the Examiner does not contend that it does.

Regarding claims 18, 44 and 68, which depend from independent claims 1, 21 and 46, respectively, these claims recite at least one third arrangement which is **specifically configured** to track the phase difference between at least one of:

- o the at least one first electromagnetic radiation and the at least one second electromagnetic radiation, or
- o the at least one third electromagnetic radiation and the at least one fourth electromagnetic radiation.

In the Office Action, it appears that the Examiner believes that such recited subject matter is described in the Swanson Patent. (See Office Action, p. 6, last two lines

through p. 7, third line). However, the Swanson Patent does not describe any system which is **specifically configured** to track the phase difference of the radiation provided to the sample and reference, or such phase difference of the radiation reflected therefrom. The Examiner further states that the interference patterns detected by the system of the Swanson Patent are generated by the phase differences between the light beam due to the optical path differences. (See *id.*) This is not accurate – in fact, the interference patterns detected by the system of the Swanson are generated by **frequency** differences, and not ***phase differences***, as recited in claims 18, 44 and 68.

With respect to claim 19, which depends from independent claim 1, this claim recites **an arrangement emitting a particular radiation which is provided to the at least one first arrangement when the at least one first arrangement provides the first and second electro-magnetic radiations based on the particular radiation, wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond.** Thus, these claims include certain similar recitations as provided in independent claims 71 and 79. Accordingly, the same argument as provided above with respect to amended independent claims 46 and 69 are equally applicable to amended claims 13 and 39.

For claim 27 which depends from independent claim 21, this claim recites that the reference is **non-reflective**. Thus, this claim includes certain similar recitations as provided in independent claims 1 and 20 . Accordingly, the same argument as provided above with respect to independent claims 1 and 20 are equally applicable to claim 27.

Concerning claims 29 and 30 which depend from independent claim 21, claim 20 recites that **a rate of change of the median of the spectrum is at least 1000 nm/msec**, and claim 30 recites that **the spectrum change over time repetitively with a repetition rate of at least 10 kHz**. However, with the device of the Swanson Patent, such wavelength tuning rate as recited in claims 29 and 30 would not be achievable. In addition, similar arguments as provided for independent claims 71 and 79 are also applicable for claims 29 and 30.

Regarding amended claim 32 which depends from independent claim 21, this claim recites that **the spectral filter includes a polygon scanner, a spectral separating arrangement that vary the spectrum over time, and at least one optical imaging arrangement which is configured to directly receive from the spectral separating arrangement one or more components of the interference, and converge and project the one or more components of the interference onto an image plane**. In fact, none of the Swanson, Tearney or Faxvog Patents discloses at least one optical imaging arrangement which is configured to directly receive from the spectral separating arrangement one or more components of the interference, and converge and project the one or more components of the interference onto an image plane, as recited in amended claim 32.

#### IV. **NEW CLAIMS 96 AND 97**

New claims 96 and 97 have been added above to recite additional subject matter for Examiner's consideration. Support for these new claims can be found in the specification and the drawings. Claims 96 and 97 depend from independent claims 21 and

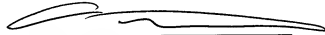
45, respectively, and thus are believed to be allowable over the Swanson Patent, taken alone or in combination with the Tearney Patent, for at least the same reasons as provided above with respect these independent claims. In addition, new claims 86 and 97 include certain recitations as provided in independent claims 71 and 79. Thus, the arguments provided above for such independent claims are applicable to claims 96 and 97. A conformation of allowability of these new claims is thus respectfully requested.

V. CONCLUSION

In light of the foregoing, Applicants respectfully submit that pending claims 1-62, 64-80, 96 and 97 are in condition for allowance. Prompt consideration, reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

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